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Navel

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VITELLINE-DUCT REMAINS AT THE NAVEL.¹

IN November, 1892, a boy, 15 years old, was brought to me by his father because the navel, which he stated had never healed, had become a source of discomfort to his son, especially when walking. It was learned that there had been something wrong with the navel since birth, and the blame for this was placed on the midwife, who was supposed to have made some mistake in cutting the cord. There had been no special inconvenience felt until very recently, when it was noticed that the navel became tender and sore, particularly after walking or running; a little matter had also appeared, staining the clothes. It was noticed that the boy walked carefully, bending his body forward. The previous history was otherwise negative, and the father had no knowledge of any such or similar conditions in any of the other members of the family. Physical examination showed a well-developed boy, in good general health, whose body was free from all blemish except at the umbilicus, which presented the following appearance:

Projecting from its lower third is a pedunculated, polypoid outgrowth (Fig. 1), 2.5 centimetres in length and 3 centimetres at its widest circumference near the rounded, free end. This mass is of a uniform deep-red color, its surface delicately smooth and velvety, covered with grayish, mucoid shreds. The narrow peduncle is apparently attached to the fibrous structures in the floor of the umbilical depression, as the volume cannot be diminished the slightest by pressure toward the abdominal cavity. In other words, this red mass is not reducible. There is no opening found upon the surface, nor depression that might suggest the previous existence of any orifice or canal. The line of junction of the skin with the covering of the peduncle at the

¹ Read before the Gynecological Society of Chicago, April 21st, 1893.

bottom of the umbilicus is even and abrupt. The pedicle crowds upward the folds of the integument covering the navel, and it is somewhat compressed as it escapes from the grasp between these folds and the circumference of the umbilicus below, upon which are small but exceedingly sensitive ulcers. The mass itself is not sensitive to the touch, but it bleeds readily, bright-red blood oozing out when handled a little roughly.

A diagnosis of a so-called adenoma or diverticular prolapse at the umbilicus was made, a ligature was placed around the pedicle near its attachment, and the polypoid outgrowth was cut away with scissors. No hemorrhage followed. In a week the ligature fell off, and in a few weeks afterward the little red spot left was completely cicatrized.



FIG. 1.—Showing polypoid umbilical outgrowth.

Immediately after its removal the mass was divided into numerous suitable pieces, fixed in Flemming's solution, washed in water, dehydrated in alcohol, embedded in paraffin, and microtomed. The sections thus obtained were stained in various fluids, and the microscopical appearances may be summarily described as follows: There are two principal layers to be taken into account—a peripheral or glandular zone, and an internal central mass consisting of smooth muscular fibres and connective tissue. The surface is lined or covered with tall, symmetrically nucleated, columnar cells without any demonstrable cilia, placed upon an unbroken, quite homogeneous basement membrane. Projecting from this surface are villous, club-shaped masses consisting of loosely meshed connective tissue, in

which are many nuclei and small blood vessels. Between these rather short, club-shaped villi are the openings of the gland tubules which compose the glandular zone of the outgrowth. The tubules are lined with more or less cuboidal epithelial cells, disposed in a single layer, with a tendency to assume the appearance of cylindrical cells as the free surface is approached. The tubules terminate in blind extremities which are buried in the intertubular connective tissue deep down in the mass; their lumina are empty; the cells present distinct outlines, a granular protoplasm, and deeply stained nuclei. In many of the cells, both of those lining the tubules and the free surface, are

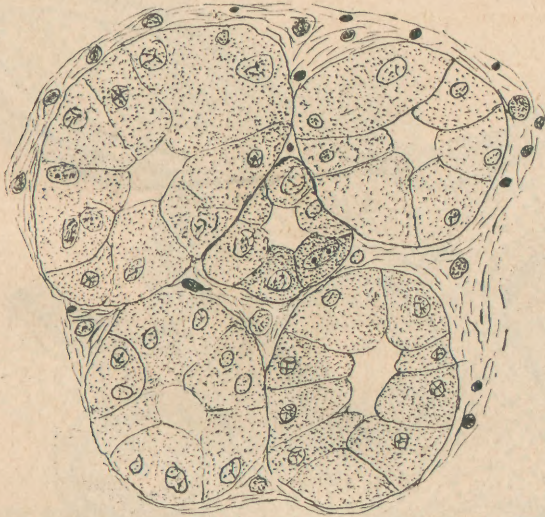


FIG. 2.—Cross section of tubules in glandular layer. Camera-lucida drawing. $\times 320$.

seen typical karyokinetic figures in the sections prepared for the purpose of bringing them into prominence (Fig. 4). In Fig. 2 is presented a portion of the deeper strata of the glandular zone with the tubules in transverse section. In Fig. 3 is a portion of the periphery, with a villous projection which has been cut in a direction somewhat oblique with reference to the main or longitudinal axis of the outgrowth, and this fact will explain the presence in its centre of hollow spaces lined with tall, columnar cells. The intertubular tissue contains quite a number of blood vessels of medium size, the majority containing blood; there are also a few foci of round-cell infiltration here and there, suggesting some inflammatory process.

Internally, to the blind extremities of the tubules and the accompanying intertubular connective tissue is a zone of smooth muscular tissue whose arrangement cannot be said to follow any definite plan, and in the very centre of the whole mass is a quantity of rather firm, fibrillated connective tissue. No lymphatic-gland structure was found in any part of the sections examined.

The microscopical structure of the outgrowth consequently corresponds very closely with the structure of the mucous mem-

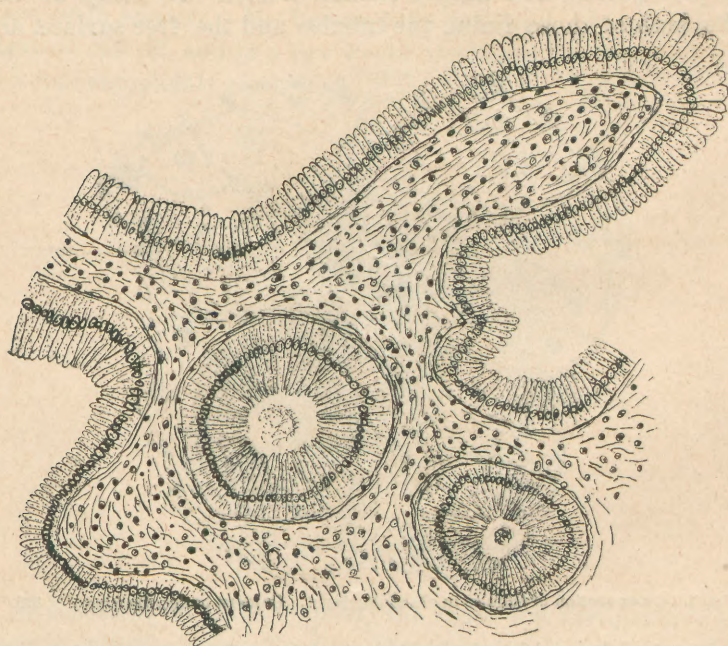


FIG. 3.—Oblique section through villous projection from surface. Camera-lucida drawing. $\times 320$.

brane of the small intestine, with its Lieberkühn's follicles or glandular tubules, the villous projections from the surface, and the characteristic cylindrical-celled lining of its exterior. The structure of the central part of the mass also reproduces the smooth muscular and the connective tissue found in the wall of the small intestine, although the arrangement of these tissues is not typical of that in the intestine. It is therefore plain that the polypoid umbilical outgrowth described is an instance of the so-called diverticular prolapse at the navel, which is some-

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what unusual from the fact that, although congenital, it was first brought under observation fifteen years after birth.

The congenital umbilical outgrowths whose structure reproduces more or less perfectly some part of the gastro-intestinal canal, and of which the specimen just described is a typical example, are now generally regarded as connected with persistent omphalo-mesenteric structures. Küstner^{2,3} was the first to distinguish by means of a microscopic examination between the granulation cell outgrowth and the adenoma, as he called the glandular masses, although Kolaczek¹ had already traced the origin of this adenoma of Küstner^{2,3} to the partial or complete prolapse of the wall of the persistent abdominal segment of the

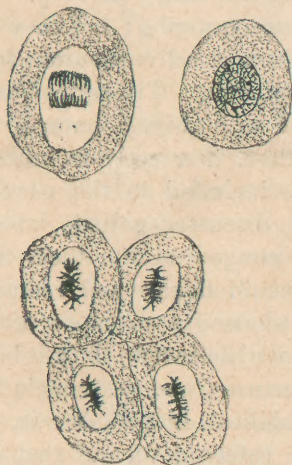


FIG. 4.—Karyokinetic figures in cells lining the glandular tubules. Seitz obj. one-twelfth oil immersion, eyepiece 5, tube length 160 mm., camera lucida. Section stained with gentian violet.

vitelline duct, and he gave the structure the name of enteroteratoma. Küstner subsequently accepted this theory of Kolaczek^{1,4} as the probable mode of origin, but at the same time he called attention to the possibility that the masses might also be due to inclusions at the navel of portions of the digestive tract from that period of embryonal development when part of the alimentary canal is temporarily extruded into the umbilical cord. The temporary umbilical hernia thus produced occurs, according to Minot,⁵ only in man, and it can be observed in embryos at the second month. The production of the hernia is as-

¹ The small figures refer to bibliography at end of the article.

cribed to traction produced by the yolk sac through its stalk. Following Küstner and Kolaczek, all subsequent observers, almost without an exception, attribute the congenital glandular masses as due to malformations or inclusions on the part of the omphalo-mesenteric duct. Ziegler⁶ says that adenoid masses may grow from duct remnants in the navel, and Orth⁷ traces the small outgrowths covered with mucous membrane to a partial or complete prolapse of the wall at the outer diverticular opening, while Klebs speaks of them as combination tumors that may come either from dislocated parts of the digestive tract or from vitelline-duct remnants. Lannelongue and Frémont⁸ revert to the possibility of some of these growths originating from navel inclusions of parts of intestinal loops in the umbilical hernia, strangulation not occurring; but they favor the view that the structures come from the diverticulum formed by remnants of the vitello-intestinal duct. Tillmanns⁹ assumes, in order to explain the origin of an umbilical outgrowth covered with pyloric mucous membrane, that early in embryonal life a piece of the stomach was included in the navel; this and similar cases will be further discussed a little later on. William Anderson²⁹ describes a congenital umbilical fistula with non-development of the sigmoid flexure and rectum, post-mortem examination of which showed a prolapse of the ileum one and one-quarter inches above the cecum, the gut being firmly attached to the umbilical aperture; and he concludes that there had existed a sort of umbilical Littré's hernia, persistent from the early fetal condition referred to, and that part of this hernia had been cut off in the removal of the cord, because the fistula developed on the second day after birth. He does not mention anything about the possibility of a Meckel's diverticulum protruding into the cord, the distal cut end of which was not examined. Roth¹⁰ concludes an instructive article on malformations connected with the omphalo-mesenteric duct about as follows: There may be found (1) the common Meckel's diverticulum free in the abdominal cavity, in a hernial sac, or, very rarely, intramesenteric; (2) the diverticulum may be adherent by means of its blind extremity, or by means of a fibrous cord formed by the obliterated remnants of the omphalo-mesenteric vessels, to the navel, or, less frequently, to some other part of the abdominal wall; (3) the diverticulum is patent, the condition being one of umbilical fistula, and the external opening at the umbilicus may

be surmounted by a partial or complete prolapse of the diverticular wall, and this condition may also become complicated by a secondary intestinal prolapse through the open diverticulum, (4) the diverticulum forms the starting point of retention cysts; entero-cystoma, which may or may not remain in connection with the intestine, and whose location may vary considerably.

The importance of persistent intra-abdominal omphalo-mesenteric remains in the causation of intestinal duplication, cyst formation, and obstruction is clearly elaborated in the classical essay of Fitz;¹¹ and it is among the conditions referred to more especially under the third class of omphalo-mesenteric malformations, as tabulated by Roth,¹⁰ that an explanation is to be found of the origin of the majority of congenital glandular enlargements at the umbilicus. These enlargements may assume various shapes. Most numerous are the polypoid and pedunculated congenital masses, whose covering is an exact reproduction of the normal mucous membrane of some part of the small intestine or the stomach. The interior consists of smooth muscular fibres and connective tissue, often arranged in such a way that the production of the mass might be thought to result from the eversion and prolapse through the umbilical opening of a small area of some part of the alimentary canal, the serous surfaces subsequently becoming firmly adherent to each other. Such polypoid masses are in the majority of instances solid, without any passages or canals, and their connection with more or less perfect intra-abdominal omphalo-mesenteric structure is as yet unknown, because there is no record of any observations upon this point either after death or during a laparotomy. It is assumed by many writers that these fleshy tumors, or mucous umbilical polypi, as some call them, originate from the partial or lateral eversion and prolapse at the navel of the wall of an open Meckel's diverticulum; that the serous surfaces of the prolapsed portion unite, while the opening into the canal of the diverticulum becomes obliterated, so that a post-mortem examination ought to show a diverticulum adherent to the umbilicus. In other cases the navel outgrowth has one, or even two, openings upon its external surface, which may lead into canals that may terminate blindly or may empty into the lumen of some part of the intestine. Externally the masses with fistulous passages are covered with a mucous lining similar to that found on the solid tumors, but this mucous membrane is also found

to line the fistulous canals. In one instance Roth¹⁰ was able to make an examination after death of a six-months-old child that presented during life a bright-red polypoid mass, two centimetres long, at the navel. Through an opening upon the summit a probe could be passed for some centimetres. Particles of food also came out of this opening occasionally. The specimen showed, as described and figured by Roth,¹⁰ a patent diverticulum, fifty-six centimetres above the ileo-cecal valve, which opened at the umbilicus; and through this opening a circular prolapse of the diverticular wall had ensued, producing the external polypoid mass with its central canal, the lining and covering being characteristic intestinal mucous membrane. Roth¹⁰ assumes that in the separation of the funis the blind and attached end of the diverticulum was opened. Holt¹² refers to several cases in the literature, a number of which were collected by Barth,¹³ of umbilical outgrowths with openings and canals; in some of these cases there were two fistulous canals, and Holt¹² shows by a number of instructive diagrams the various modes and degrees of eversion and prolapse of the diverticular wall and of the intestine through the patent diverticulum, that explain very satisfactorily the origin of these curious malformations, the fundamental condition in all of which is a persistent and patent diverticulum adherent to the navel. The instance of unique congenital malformation described and illustrated by Gibb¹⁴ is undoubtedly, as pointed out by Holt,¹² an example of a patent diverticulum in an umbilical hernia complicated with prolapse and eversion. Chandelux¹⁵ describes a projection at the navel, six centimetres long, covered externally with mucous membrane, showing a short, blind canal, and he believes that this was a totally prolapsed and almost completely everted diverticulum whose connection with the intestine was interrupted.

In connection with this it is also of interest to note that enterocystoma may occur at the navel or in the abdominal wall in its immediate vicinity; these cysts, the structure of the wall of which is identical with that of the intestine, are believed by Fitz,¹¹ Roth,¹⁰ and other writers to originate from unobliterated vitelline-duct inclusions in the abdominal parietes. Zumwinkel¹⁶ describes such a cyst about the navel in a child 7 years old, and similar instances are detailed by Roser¹⁷ and Wyss.¹⁸

As long as enterocystomata have been found in the abdominal

wall without any connection with the intestine, it is also quite plain that all of the solid polypoid navel outgrowths need not necessarily be connected with any persistent intra-abdominal omphalo-mesenteric remains; they might develop from inclusions in the navel, just as the entero-cystoma is believed to do. On the other hand, many of the enlargements with fistulous passages undoubtedly develop, as shown by Roth's¹⁰ observation, from the eversion and prolapse of the wall of a patent diverticulum opening at the navel; and there is no reason why many of the masses without any canals should not be due to partial or lateral prolapse of the diverticular wall, and it would seem reasonable to state that post-mortem examination some time in the future will show that some of the solid masses are connected with abdominal remnants, while others are not.

That all polypoid, red masses congenitally present at the umbilicus are not necessarily due to vitelline-duct remains is intimated by the case of fleshy navel tumor with patent urachus described by French¹⁹ in a girl 6 weeks old, who presented a red umbilical protrusion through a small opening, on which there issued urine; there was no microscopic examination to show positively whether this was an instance of eversion and prolapse connected with a patent urachus or not. At this time it is also necessary to speak particularly of the cases of umbilical outgrowths described by Tillmanns,⁹ Heukelom,²⁰ Ball,²¹ and many more, in which the growths were covered with a mucous membrane identical with that of the pyloric end of the stomach, and which were styled by Tillmanns'° *ectopia ventriculi* and ascribed to inclusions at the navel from the time of the temporary umbilical hernia referred to. Heukelom,²⁰ however, found in a free intra-abdominal diverticulum in a new-born child, arising a moderate distance above the ileo-cecal valve, an area the mucous membrane of which corresponded exactly to that of the pylorus in the same individual; and he came to the conclusion, after further extended observations, that originally the whole intestinal tract is clothed with similar epithelium, which is differentiated later in embryonal life, and he consequently explains Tillmanns'° *ectopia ventriculi* as due to navel inclusions of areas from diverticula lined with mucous membrane identical with the pyloric mucosa of full-term children. At the same time it must not be forgotten that many instances are re-

corded of diverticula arising from the upper portions of the small intestine. Meckel, cited by Fitz,¹¹ states that Lobstein and Wrisberg observed a vitelline duct connected with the duodenum; Major described a diverticulum arising from the jejunum and provided for some distance with valvulae conniventes; and, according to Fitz,¹¹ some authors refer the origin of some of the esophageal diverticula to the insertion of the duct into the upper part of the alimentary canal, and thus it might be that the umbilical outgrowths with pyloric structure were due to inclusions from the vitelline ducts of uncommonly high insertion. At any rate, there is no positive evidence of any kind to decide the question raised as to the exact origin of navel tumors covered with pyloric structure, but the explanations indicated might hold good.

The congenital structures here discussed have been variously named. Küstner³ called them adenomata; Kolaczek,¹ entero-teratoma; Lannelongue and Frémont,⁶ adenoid diverticular tumors. In the English literature²⁵⁻²⁸ they are commonly referred to as congenital umbilical polypi, but the terms fleshy tumors,¹⁰ mucous polypi, and warty tumors have also been used; Miller²⁸ divides congenital polypi into those with branched and those with unbranched tubules; Holt¹² very properly objects to the terms adenoma and entero-teratoma as inappropriate and incorrect, and he entitles his case an instance of umbilical tumor due to prolapse of the intestinal mucous membrane of a Meckel's diverticulum; and Pernice,²² in his recent monograph on umbilical tumors, in which he also considers thirty-eight cases from the literature and one personal case of this so-called adenoma, disapproves of this word and of the term entero-teratoma, and proposes the name diverticular prolapse at the umbilicus as descriptive and explanatory of the nature and origin of the swelling; while Vellar^{23 24} introduces the term gastro-teratoma, or gastric adenoma, in order to distinguish between those growths covered with intestinal mucosa—the entero-teratoma or intestinal adenoma—and those covered with pyloric mucosa. Inasmuch as the only fact in regard to the origin of these growths in any way demonstrated is their quite undoubted connection with omphalo-mesenteric remains at the navel, while the condition of affairs in the abdominal cavity when they occur is practically unknown, it would seem that such terms as diverticular prolapse really presuppose more than is actually and definitely known.

A short and appropriate name is difficult, if not impossible, to invent, and consequently the phrase polypoid vitelline-duct remains at the navel, or some modification thereof, appears exact and descriptive enough at the present time.

Such vitelline-duct remnants at the navel cannot be so very infrequent, as shown by the number of cases described in the literature during the last few years since attention has been directed to them. They are congenital; appear, on the separation of the cord, implanted on the umbilical cicatrix; they may be small and nodular or polypoid and pedunculated; usually less than one centimetre in length, but occasionally much longer; their surface is smooth, velvety, and uniformly deep red in color, being often aptly compared in this respect with the color of the rectal mucous membrane; there is, as a rule, no orifice to be found on the surface, but instances are described of growths with shallow depressions, blind passages, and complete fistulous canals leading into the intestine. The solid growths, which are here especially considered, are irreducible, do not diminish in volume on compression, and there is no gurgling and no tympanites on percussion; the mucous covering secretes a viscid fluid, which in Tillmanns' instance was acid in reaction and contained pepsin, showing the functional as well as the histological similarity between the lining and the gastric mucosa. The patients remain in good health, and there have not been noticed any unusual abdominal symptoms in these cases. The structures grow almost imperceptibly, and it does not seem that in any case has the increase in size been out of proportion to the general growth of the individual. In the case here described it was thought that the polypoid remnant was a little larger when the boy was 15 years old than it was at birth. Vitelline-duct remnants can be positively distinguished from the umbilical granuloma, capillary angioma, and from possible allantoic remains by means of the microscopic examination only. They are to be removed by thorough surgical measures, care being taken in the preliminary examination to establish with absolute certainty the absence or presence of any fistulous passages, which, if present, might materially change the *modus operandi*, should the removal of the growth then be decided upon. The removal should be thorough, in order to prevent any possibility of any form of carcinoma originating from the epithelial cells of the inclusion, according to the familiar mis-

placed embryonal matrix theory of Cohnheim. Pernice²² showed, in his thorough study of carcinoma of the umbilicus, that in a number of primary tumors the structure corresponded with that in intestinal carcinoma, and he surmises that such tumors might originate from omphalo-mesenteric remains. Lastly, it may be allowed to call attention to the lesson conveyed by Anderson's case,²⁹ to leave a long stump when dividing the cord, as a precautionary measure against the possible division of prolapsed abdominal contents in the interior of the cord, whose presence might not be suspected from the external examination of the child.

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